

TAPEWORM infection

Drug	Adult dosage	Pediatric dosage
— Adult (intestinal stage)		
Diphyllobothrium latum (fish), Taenia saginata (beef), Taenia solium (pork), Dipylidium caninum (dog)		
Drug of choice: Praziquantel ^{1,2}	5-10 mg/kg PO once	5-10 mg/kg PO once
Alternative: Niclosamide ^{3*}	2 g PO once	50 mg/kg PO once
Hymenolepis nana (dwarf tapeworm)		
Drug of choice: Praziquantel ^{1,2}	25 mg/kg PO once	25 mg/kg PO once
Alternative: Nitazoxanide ^{1,4}	500 mg PO once/d or bid x 3d ⁵	1-3yrs: 100 mg PO bid x 3d ⁵ 4-11yrs: 200 mg PO bid x 3d ⁵
— Larval (tissue stage)		
Echinococcus granulosus (hydatid cyst)		
Drug of choice: ⁶ Albendazole ⁷	400 mg PO bid x 1-6mos	15 mg/kg/d (max. 800 mg) x 1-6mos
Echinococcus multilocularis		
Treatment of choice: See footnote 8		
Taenia solium (Cysticercosis)		
Treatment of choice: See footnote 9		
Alternative: Albendazole ⁷	400 mg PO bid x 8-30d; can be repeated as necessary	15 mg/kg/d (max. 800 mg) PO in 2 doses x 8-30d; can be repeated as necessary
OR Praziquantel ^{1,2}	100 mg/kg/d PO in 3 doses x 1 day then 50 mg/kg/d in 3 doses x 29 days	100 mg/kg/d PO in 3 doses x 1 day then 50 mg/kg/d in 3 doses x 29 days

* Availability problems. See table below.

1. Not FDA-approved for this indication.

2. Praziquantel should be taken with liquids during a meal.

3. Niclosamide must be chewed thoroughly before swallowing and washed down with water.

4. Nitazoxanide may be effective against a variety of protozoan and helminth infections (DA Bobak, Curr Infect Dis Rep 2006; 8:91; E Diaz et al, Am J Trop Med Hyg 2003; 68:384). It was effective against mild to moderate amebiasis, 500 mg bid x 3d, in a recent study (JF Rossignol et al, Trans R Soc Trop Med Hyg 2007 Oct; 101:1025 E pub 2007 July 20). It is FDA-approved only for treatment of diarrhea caused by *Giardia* or *Cryptosporidium* (Med Lett Drugs Ther 2003; 45:29). Nitazoxanide is available in 500-mg tablets and an oral suspension; it should be taken with food.

5. JO Juan et al, Trans R Soc Trop Med Hyg 2002; 96:193; JC Chero et al, Trans R Soc Trop Med Hyg 2007; 101:203; E Diaz et al, Am J Trop Med Hyg 2003; 68:384.

6. Patients may benefit from surgical resection or percutaneous drainage of cysts. Praziquantel is useful preoperatively or in case of spillage of cyst contents during surgery. Percutaneous aspiration-injection-reaspiration (PAIR) with ultrasound guidance plus albendazole therapy has been effective for management of hepatic hydatid cyst disease (RA Smego, Jr. et al, Clin Infect Dis 2003; 37:1073; S Nepalia et al, J Assoc Physicians India 2006; 54:458; E Zerem and R Jusufovic Surg Endosc 2006; 20:1543).

7. Albendazole must be taken with food; a fatty meal increases oral bioavailability.

8. Surgical excision is the only reliable means of cure. Reports have suggested that in nonresectable cases use of albendazole (400 mg bid) can stabilize and sometimes cure infection (P Craig, Curr Opin Infect Dis 2003; 16:437; O Lidove et al, Am J Med 2005; 118:195).

9. Initial therapy for patients with inflamed parenchymal cysticercosis should focus on symptomatic treatment with anti-seizure medication (LS Yancey et al, Curr Infect Dis Rep 2005; 7:39; AH del Brutto et al, Ann Intern Med 2006; 145:43). Patients with live parenchymal cysts who have seizures should be treated with albendazole together with steroids (dexamethasone 6 mg/d or prednisone 40-60 mg/d) and an anti-seizure medication (HH Garcia et al, N Engl J Med 2004; 350:249). Patients with subarachnoid cysts or giant cysts in the fissures should be treated for at least 30d (JV Proaño et al, N Engl J Med 2001; 345:879). Surgical intervention (especially neuroendoscopic removal) or CSF diversion followed by albendazole and steroids is indicated for obstructive hydrocephalus. Arachnoiditis, vasculitis or cerebral edema is treated with prednisone 60 mg/d or dexamethasone 4-6 mg/d together with albendazole or praziquantel (AC White, Jr., Annu Rev Med 2000; 51:187). Any cysticercocidal drug may cause irreparable damage when used to treat ocular or spinal cysts, even when corticosteroids are used. An ophthalmic exam should always precede treatment to rule out intraocular cysts.

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MANUFACTURERS OF DRUGS USED TO TREAT PARASITIC INFECTIONS

albendazole – <i>Albenza</i> (GlaxoSmithKline) – albendazole	clindamycin – <i>Cleocin</i> (Pfizer), others
<i>Alinia</i> (Romark) – nitazoxanide	<i>Coartem</i> (Novartis) – artemether/lumefantrine
<i>AmBisome</i> (Gilead) – amphotericin B, liposomal	crotamiton – <i>Eurax</i> (Westwood-Squibb)
amphotericin B – <i>Fungizone</i> (Apothecon), others	dapsone – (<i>Jacobus</i>)
amphotericin B, liposomal – <i>Ambisome</i> (Gilead)	§ <i>Daraprim</i> (GlaxoSmithKline) – pyrimethamine USP
<i>Ancobon</i> (Valeant) – flucytosine	† diethylcarbamazine citrate (DEC) – <i>Hetrazan</i>
§ <i>Antiminth</i> (Pfizer) – pyrantel pamoate	• <i>Diflucan</i> (Pfizer) – fluconazole
• <i>Aralen</i> (Sanofi) – chloroquine HCl and chloroquine phosphate	§ diloxanide furoate – <i>Furamide</i> (Boots, United Kingdom)
§ artemether – <i>Artenam</i> (Arenco, Belgium)	doxycycline – <i>Vibrامycin</i> (Pfizer), others
§ artemether/lumefantrine – <i>Coartem</i> , <i>Riamet</i> (Novartis)	† eflornithine (Difluoromethylornithine, DFMO) – <i>Ornidyl</i> (Aventis)
§ <i>Artenam</i> (Arenco, Belgium) – artemether	§ <i>Egaten</i> (Novartis) – triclabendazole
§ artesunate – (Guilin No. 1 Factory, People's Republic of China)	<i>Elimite</i> (Allergan) – permethrin
atovaquone – <i>Mepron</i> (GlaxoSmithKline)	<i>Ergamisol</i> (Janssen) – levamisole
atovaquone/proguanil – <i>Malarone</i> (GlaxoSmithKline)	<i>Eurax</i> (Westwood-Squibb) – crotamiton
azithromycin – <i>Zithromax</i> (Pfizer), others	• <i>Flagyl</i> (Pfizer) – metronidazole
• <i>Bactrim</i> (Roche) – TMP/Sulfa	§ <i>Flisint</i> (Sanofi-Aventis, France) – fumagillin
§ benznidazole – <i>Rochagan</i> (Brazil)	fluconazole – <i>Diflucan</i> (Pfizer), others
• <i>Biaxin</i> (Abbott) – clarithromycin	flucytosine – <i>Ancobon</i> (Valeant)
§ <i>Biltricide</i> (Bayer) – praziquantel	§ fumagillin – <i>Flisint</i> (Sanofi-Aventis, France)
† bithionol – <i>Bitin</i> (Tanabe, Japan)	• <i>Fungizone</i> (Apothecon) – amphotericin
† <i>Bitin</i> (Tanabe, Japan) – bithionol	§ <i>Furamide</i> (Boots, United Kingdom) – diloxanide furoate
§ <i>Brolene</i> (Aventis, Canada) – propamidine isethionate	§ furazolidone – <i>Eurozone</i> (Roberts)
chloroquine HCl and chloroquine phosphate – <i>Aralen</i> (Sanofi), others	§ <i>Eurozone</i> (Roberts) – furazolidone
clarithromycin – <i>Biaxin</i> (Abbott), others	† <i>Germanin</i> (Bayer, Germany) – suramin sodium
• <i>Cleocin</i> (Pfizer) – clindamycin	§ <i>Glucantime</i> (Aventis, France) – meglumine antimonate

(continued)

iodoquinol – <i>Yodoxin</i> (Glenwood), others	permethrin – <i>Nix</i> (GlaxoSmithKline), <i>Elmite</i> (Allergan)
itraconazole – <i>Sporanox</i> (Janssen-Ortho), others	§ praziquantel – <i>Biltricide</i> (Bayer)
ivermectin – <i>Stromectol</i> (Merck)	primaquine phosphate USP
ketoconazole – <i>Nizoral</i> (Janssen), others	§ proguanil – <i>Paludrine</i> (AstraZeneca, United Kingdom)
† <i>Lampit</i> (Bayer, Germany) – nifurtimox	proguanil/atovaquone – <i>Malarone</i> (GlaxoSmithKline)
<i>Lariam</i> (Roche) – mefloquine	§ propamidine isethionate – <i>Brolene</i> (Aventis, Canada)
§ <i>Leshcutan</i> (Teva, Israel) – topical paromomycin	§ pyrantel pamoate – <i>Antiminth</i> (Pfizer)
levamisole – <i>Ergamisol</i> (Janssen)	pyrethrins and piperonyl butoxide – <i>RID</i> (Pfizer), others
lumefantrine/artemether – <i>Coartem</i> , <i>Riamet</i> (Novartis)	§ pyrimethamine USP – <i>Daraprim</i> (GlaxoSmithKline)
<i>Malarone</i> (GlaxoSmithKline) – atovaquone/proguanil	<i>Qualaquin</i> – quinine sulfate (Mutual Pharmaceutical Co/AR Scientific)
malathion – <i>Ovide</i> (Medicis)	quinacrine
mebendazole – <i>Vermox</i> (McNeil), others	* quinidine gluconate (Eli Lilly)
mefloquine – <i>Lariam</i> (Roche)	§ quinine dihydrochloride
§ meglumine antimonate – <i>Glucantime</i> (Aventis, France)	quinine sulfate – <i>Qualaquin</i> (Mutual Pharmaceutical Co/AR Scientific)
† melarsoprol – <i>Mel-B</i>	<i>Riamet</i> (Novartis) – artemether/lumefantrine
† <i>Mel-B</i> – melarsoprol	• <i>RID</i> (Pfizer) – pyrethrins and piperonyl butoxide
<i>Mepron</i> (GlaxoSmithKline) – atovaquone	• <i>Rifadin</i> (Aventis) – rifampin
metronidazole – <i>Flagyl</i> (Pfizer), others	rifampin – <i>Rifadin</i> (Aventis), others
§ miconazole – <i>Monistat i.v.</i>	§ <i>Rochagan</i> (Brazil) – benznidazole
§ miltefosine – <i>Impavido</i> (Zentaris, Germany)	* <i>Rovamycin</i> (Aventis) – spiramycin
§ <i>Monistat i.v.</i> – miconazole	† sodium stibogluconate – <i>Pentostam</i> (GlaxoSmithKline, United Kingdom)
<i>NebuPent</i> (Fujisawa) – pentamidine isethionate	* spiramycin – <i>Rovamycin</i> (Aventis)
§ niclosamide – <i>Yomesan</i> (Bayer, Germany)	• <i>Sporanox</i> (Janssen-Ortho) – itraconazole
† nifurtimox – <i>Lampit</i> (Bayer, Germany)	<i>Stromectol</i> (Merck) – ivermectin
nitazoxanide – <i>Alinia</i> (Romark)	sulfadiazine – (Eon)
<i>Nix</i> (GlaxoSmithKline) – permethrin	† suramin sodium – <i>Germanin</i> (Bayer, Germany)
• <i>Nizoral</i> (Janssen) – ketoconazole	§ <i>Tiberal</i> (Roche, France) – ornidazole
§ ornidazole – <i>Tiberal</i> (Roche, France)	<i>Tindamax</i> (Mission) – tinidazole
† <i>Ornidyl</i> (Aventis) – eflornithine	tinidazole – <i>Tindamax</i> (Mission)
(Difluoromethylornithine, DFMO)	TMP/Sulfa – <i>Bactrim</i> (Roche), others
<i>Ovide</i> (Medicis) – malathion	§ triclabendazole – <i>Egaten</i> (Novartis)
§ oxamniquine – <i>Vansil</i> (Pfizer)	§ <i>Vansil</i> (Pfizer) – oxamniquine
§ <i>Paludrine</i> (AstraZeneca, United Kingdom) – proguanil	• <i>Vermox</i> (McNeil) – mebendazole
paromomycin – <i>Humatin</i> (Monarch); <i>Leshcutan</i> (Teva, Israel; topical formulation not available in US)	• <i>Vibramycin</i> (Pfizer) – doxycycline
<i>Pentam 300</i> (Fujisawa) – pentamidine isethionate	• <i>Yodoxin</i> (Glenwood) – iodoquinol
pentamidine isethionate – <i>Pentam 300</i> (Fujisawa), <i>NebuPent</i> (Fujisawa)	§ <i>Yomesan</i> (Bayer, Germany) – niclosamide
† <i>Pentostam</i> (GlaxoSmithKline, United Kingdom) – sodium stibogluconate	• <i>Zithromax</i> (Pfizer) – azithromycin

* Available in the US only from the manufacturer.

§ Not available commercially. It may be obtained through compounding pharmacies such as Panorama Compounding Pharmacy, 6744 Balboa Blvd, Van Nuys, CA 91406 (800-247-9767) or Medical Center Pharmacy, New Haven, CT (203-688-6816). Other compounding pharmacies may be found through the National Association of Compounding Pharmacies (800-687-7850) or the Professional Compounding Centers of America (800-331-2498, www.pccarx.com).

† Available from the CDC Drug Service, Centers for Disease Control and Prevention, Atlanta, Georgia 30333; 404-639-3670 (evenings, weekends, or holidays: 404-639-2888).

• Also available generically.

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